DOCUMENT RESUME

ED 213 747 TM 820 156

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TITLE Aptitude Composites for ASVAB 8, 9, and 10.
INSTITUTION Army Research Inst. for the Behavioral and Social Sciences, Alexandria, Va.
REPORT NO ARI-RR-1308
PUB DATE May 81
NOTE 34p.

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Aptitude Tests; *Armed Forces; *Job Performance; *Predictive Measurement; Predictive Validity; Screening Tests; *Test Validity
IDENTIFIERS *Armed Services Vocational Aptitude Battery; *Skill Qualification Test

ABSTRACT

Selection and classification testing throughout the nation has been subject to widespread criticism and legal attack. Tests used by the military service, however, have been largely immune from the criticism. A major reason is that from their inception, military tests have been carefully validated as predictors of successful performance. The traditional criterion measure in the military has been success in skill training courses. In this report a significant new measure of successful performance has been used as the criterion measure. The Skill Qualification Test (SQT), developed by the Army to assess performance on critical job tasks and identify training deficiencies, was used as the criterion for evaluating the effectiveness of the Armed Services Vocational Aptitude Battery (ASVAB) and for developing new aptitude composites. The aptitude composites had high validity in the range .52 to .75 for predicting job proficiency. Criticisms of the usefulness of SQTs as measures of job proficiency are addressed. (Author/GK)

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Research Report 1308

APTITUDE COMPOSITES FOR ASVAB 8, 9, AND 10

Milton H. Maier and Frances C. Grafton

PERSONNEL UTILIZATION TECHNICAL AREA

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER Research Report 1308	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) APTITUDE COMPOSITES FOR ASVAB 8, 9, AND 10		5. TYPE OF REPORT & PERIOD COVERED 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Milton H. Maier and Frances C. Grafton		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS US Army Research Institute for the Behavioral and Social Sciences, 5001 Eisenhower Avenue, Alexandria, Virginia 22333		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 2Q763731A791
11. CONTROLLING OFFICE NAME AND ADDRESS Deputy Chief of Staff for Personnel, Washington DC		12. REPORT DATE May 1981 13. NUMBER OF PAGES 24
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Selection and Classification Testing/Armed Forces Qualification Test (AFQT)/ Armed Services Vocational Aptitude Battery (ASVAB)/Skill Qualification Tests (SQT)/Job Performance Measures.

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Aptitude composites for the Armed Services Vocational Aptitude Battery (ASVAB) were developed using training success and Skill Qualification Test (SQT) scores, measures of job proficiency, as the criterion. The aptitude composites had high validity in the range .52 to .75 for predicting job proficiency. Criticisms of the usefulness of SQTs as measures of job proficiency are addressed.

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Unclassified
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

Research Report 1308

APTITUDE COMPOSITES FOR ASVAB 8, 9, AND 10

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Office, Deputy Chief of Staff for Personnel
Department of the Army

May 1981

Army Project Number
2Q763731A791

Manpower Personnel and Training

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FOREWORD

Selection and classification testing throughout the nation has been subject to widespread criticism and legal attack. Tests used by the military service, however, have been largely immune from the criticism. A major reason is that from their inception, military tests have been carefully validated as predictors of successful performance. The traditional criterion measure in the military has been success in skill training courses.

In this report a significant new measure of successful performance has been used as the criterion measure. Job proficiency tests, developed by the Army to assess performance on critical job tasks and identify training deficiencies, were used as the criterion for evaluating the effectivenss of the ASVAB and for developing new aptitude composites. The results show that ASVAB is an effective predictor of job proficiency.

This research was done by the Personnel Utilization Technical Area in response to requirements of Army Project 2Q763731A791.

JOSEPH ZEIDNER
Technical Director

APTITUDE COMPOSITES FOR ASVAB 8, 9, and 10

BRIEF

Requirements:

Revised aptitude composites were required for new forms of the ASVAB (8/9/10) implemented on 1 October 1980. Validation of the composites was accomplished by determining the most valid predictors of training success and job proficiency.

Procedures:

Skill Qualification Tests (SQT) and training performance scores were used as the criterion measures of job proficiency. The most valid sets of ASVAB subtests were selected for the aptitude composites.

Results:

The ASVAB aptitude composites had validity coefficients ranging from .52 to .75 for predicting training success and job proficiency measured from several months to three years after the ASVAB was administered. The validity of the composites is adequate to justify their operational use for selection and classification of recruits. The results support the usefulness of ASVAB as a valid predictor of proficiency and the usefulness of SQTs as measures of job proficiency.

Utilization

The aptitude composites were implemented on 1 October 1980, along with the new forms of the ASVAB, for use as screens to help determine qualification of applicants for enlistment and for assignment of recruits to skill training programs.

APTITUDE COMPOSITES FOR ASVAB 8, 9, AND 10

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APTITUDE COMPOSITES FOR ASVAB 8, 9, and 10

PURPOSE OF THE ASVAB

The Armed Services Vocational Aptitude Battery (ASVAB) is used by all services to determine mental qualification for enlistment and to classify accessions into skill training programs. The ASVAB provides an Armed Forces Qualification Test (AFQT) score, which is used to screen out applicants unqualified for enlistment. The ASVAB also provides aptitude composites, which serve a dual purpose: one is as supplementary enlistment standards to help determine qualification of those applicants who pass the AFQT; the second purpose is to determine eligibility for assignment to job specialties. The ASVAB was implemented in January 1976 as the replacement for the test batteries used until that time by the services.

PROBLEM

New forms of the ASVAB have been developed to replace the original interservice battery (forms 6 and 7). The original version contained 13 subtests, while the replacement forms (8/9/10) contain only 10 subtests. Changes in the content of the ASVAB also necessitate changes in the aptitude composites. The subtests in both the current and replacement versions, together with a brief description of each, are listed in Table 1. Each service has developed its own set of composites, based on its job structure and the validity of the subtests for its training programs.

The Army has had nine aptitude composites since 1973. Each composite is used as a prerequisite to determine qualification for a set of related skill training programs. Successful completion of the training program results in the award of a Military Occupational Specialty (MOS). For example one aptitude composite is labeled CO for Combat, and is used to classify recruits into infantry and armor specialties; another composite is labeled EL, for Electronics Repair, and is used for all electronic repair specialties in the signal and air defense fields. Each of the original nine composites contained three to five subtests that were found to be the most valid predictors of success in the job training programs.[1] The composites were developed for the Army Classification Battery, the predecessor to the ASVAB in the Army. Since the Army Classification Battery and the original ASVAB used from 1976 until October 1980 had similar subtests, the Army aptitude composites have been kept intact since 1973. The aptitude composites used from 1973 until ASVAB 8/9/10 was implemented, the subtests in each, and the type of skill specialties for which the composites serve as prerequisites are shown in Table 2.

With the changes in subtests in ASVAB 8/9/10, as compared to the previous version, the subtests in the composites needed to be changed; a related question was whether the number of composites should also be changed.

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[1]Maier, M. H. and Fuchs, E. F., Development and Evaluation of a New ACB and Aptitude Area System, Technical Research Note. 239. Alexandria, Virginia: US Army Research Institute, September 1972.

Table 1

SUBTESTS IN ASVAB

SUBTEST	Tests in ASVB Form 6/7	Tests in ASVB Form 8/9/10	DESCRIPTION
Word Knowledge	Yes	Yes	Understanding the meaning of words.
Arithmetic Reasoning	Yes	Yes	Word problems that emphasize reasoning rather than mathematical knowledge.
Space Perception	Yes	No	Identifying a three-dimensional figure obtained from folding a flat pattern.
Numerical Operations	Yes	Yes	A speed test of the four arithmetic operatons - addition, subtraction, multiplication, division.
Paragraph Comprehension	No	Yes	Understanding the meaning of paragraphs.
Electronics Information	Yes	Yes	Knowledges of electricity, radio principles, and electronics.
Mechanical Comprehension	Yes	Yes	Understanding of mechanical principles, such as gears, pulleys, and hydraulics.
General Science	Yes	Yes	Knowledge of physical and biological sciences.
Auto/Shop Information (separate subtests in ASVAB 6/7)	Yes	Yes	Knowledge of automobiles, shop practices and use of tools.
Mathematics Knowledge	Yes	Yes	Knowledges and skills in algebra, geometry and fractions.
Coding Speed	No	Yes	A speeded test to match words and numbers.
Attention-to-Detail	Yes	No	A speeded test to count the number of "C"s embedded in a series of "O"s.
General Information	Yes	No	Information on geography, sports, history, automobiles.
Classification Inventory	Yes	No	Experience in and preference for activities related to mechanical, electronics, clerical/administrative, and masculine/outdoor pursuits.

Table 2

COMPOSITION OF MOS GROUPS

MOS Group	Major Jobs in Each MOS Group
CO (Combat)	Infantry, Armor, Combat Engineer
FA (Field Artillery)	Field Cannon and Rocket Artillery
EL (Electronics Repair)	Missiles Repair, Air Defense Repair, Electronics Repair, Fixed Plant Communications Repair
OF (Operators and Food)	Missiles Crewmen, Air Defense Crewmen, Driver, Food Services
SC (Surveillance and Communications)	Target Acquisition and Combat Surveillance, Communication Operations
MM (Mechanical Maintenance)	Mechanical and Aircraft Maintenance, Rails
GM (General Maintenance)	Construction and Utilities, Chemical, Marine, Petroleum
CL (Clerical)	Administrative, Finance, Supply
ST (Skilled Technical)	Medical, Military Policeman, Intelligence, Data Processing, Air Control, Topography and Printing, Information and Audio Visual

Because of the complexity of changing the relationship between aptitude composites and individual MOS, the decision was made to change only the subtests in each composite and not to change the number of composites. A change to the relationship between composites and job specialties would require coordination among many Army agencies, including the Deputy Chief of Staff for Personnel, the Training and Doctrine Command, the Military Personnel Center, and the Recruiting Command, plus the Military Enlistment Processing Command. In addition several regulations and pamphlets, such as the manual describing the job specialties, would have required extensive revision. The relationship of aptitude composite to skill specialties can be restructured after the new forms have been validated against the modern job training programs and measures of job proficiency. This validation and restructuring will require several calendar years to complete.

Criterion Measures of Successful Performance.

Two criterion measures, success in skill training courses and scores on tests to measure job proficiency, were used for developing aptitude composites.

Skill Training. Performance in skill training courses has been the traditional criterion for validating aptitude tests. The pass-fail scores used to report success in modern performance-based training courses, however, are not satisfactory criterion measures from a psychometric point of view. From the point of view of how training relates to job requirements, the new training programs are generally superior to the traditional courses, and the measurement problems arise largely because of the particular way performance is reported: pass or fail, with no gradations in either score category. Because students in most of the Army training courses are graded only as pass-fail, the true relationship between aptitude composite scores and success in training is not accurately indicated by the statistical correlation coefficient traditionally used to report validity. The training performance data used in this study came from courses still using continuous final course grades in 1976-1977.

Job Proficiency. The second criterion for developing aptitude composites was a measure of job proficiency, obtained from Skill Qualification Tests (SQTs). SQTs are designed to assess performance of critical job tasks. They are criterion referenced in the sense that test content is based explicitly on job requirements and the meaning of the test scores is established by expert judgment prior to administration of the test rather than on the basis of score distributions obtained from administration. The content of SQTs is a carefully selected sample from the domain of critical tasks in a specialty. Tasks are selected because they are especially critical, such as a particular weapon system, or because there is a known training deficiency. The focus on training deficiencies means that relatively few on the job can perform the tasks, and the pass rate for these tasks therefore is expected to be low. Since only critical tasks in a specialty are included in SQTs, and then only the more difficult tasks tend to be selected for testing, a reasonable inference is that performance on the SQTs should be a useful indicator of proficiency on the entire domain of critical tasks in the specialty; that is, workers who are proficient on tasks included in an SQT are also proficient on other tasks in the specialty. The list of tasks in the SQT and the measure themselves

are carefully reviewed by job experts and tried out on samples of representative job incumbents prior to operational administration. The process of developing SQTs may be characterized as follows:

1. Identify tasks for testing.

2. Identify behaviors or steps essential for performing each task.

3. Develop measures to cover essential behaviors, and have these measures reviewed by job experts.

4. Tryout the measures on representative workers to verify accuracy of measurement; i.e., make sure that measures discriminate between task performers and nonperformers.

After each step, the products are reviewed for content validity. The test content cannot be changed after step 3, when the measures are approved by experts. The tryout of step 4 can be used only to improve the measures, and not to change content. When the development process is followed, the validity of the SQTs as measures of job proficiency is assured by job experts and representative workers. Complete procedures for developing SQTs are contained in a handbook[2], and a more thorough discussion of the rationale and potential uses of SQTs is presented in an ARI report.[3]

PROCEDURES

Criterion scores of success in training and of job proficiency were obtained for each skill specialty that had enough cases to permit statistical analysis; the minimum number to constitute a separate sample was set at about 100 soldiers in an MOS. A separate analysis was conducted for each sample.

The predictor measures were the ASVAB 6/7 subtests that had parallel counterparts in ASVAB 8/9/10. The subtests are listed in Table 1. In the case of Automotive and Shop Information, which were merged in ASVAB 8/9/10, the validity for both subtests was computed, and Automotive Information was arbitrarily chosen as the subtest to use in test selection for developing new composites. The ASVAB 6/7 scores of record were obtained from the Military Enlistment Processing Command for Army recruits tested in early calendar year 1976, shortly after ASVAB 6/7 was implemented. Subtest raw scores were used in the statistical analysis.

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[2]Osborn, W. C., Campbell, R. C., Ford, J. P., Hirshfeld, S. F., and Maier, M. H. Handbook for the Development of Skill Qualification Tests. Technical Report P-77-5. Alexandria, Virginia: Army Research Institute, November 1977.

[3]Maier, M. H. and Hirshfeld, S. F. Criterion Referenced Testing: A Large Scale Application. Technical Research Report 1193, Alexandria, Virginia: Army Research Institute, February 1978.

The statistical analysis consisted of computing the correlation between each ASVAB subtest and the criterion measure available for each MOS sample; these correlations are termed validity coefficients. Because the cases in each sample had been selected at the time of enlistment on the basis of aptitude composites, the correlation coefficients were corrected for restriction in range to estimate the degree of relationship for the full range of ability. Mean subtest validity coefficients were computed for all samples that had the same aptitude composite as a prerequisite for assignment into skill training. Using the mean corrected validity coefficients, subtests with the highest unique validity were selected for each composite. As a rule, subtests were added to the composites as long as they increased predictive validity. Exceptions are as follows: Because criterion data were not available before implementing ASVAB 8/9/10 two composites, Electronics Repair (EL) and General Maintenance (GM), were developed by expert judgment. In addition, two composites, Electronics Repair (EL) and Clerical (CL), were constructed to be identical for all services. The aptitude composites, then, are based on the prediction of training success or job proficiency, or both, or by expert judgment, or forced to be identical for all services.

SQT scores subsequently became available for Electronics Repair (EL) and General Maintenance (GM) samples, and analyses were conducted to evaluate the effectiveness of the composites determined by expert judgment .

RESULTS

The MOS samples used to validate the ASVAB subtests are listed in Table 3, together with the type of criterion measure (training success or SQT)[4]. SQT scores were included in the validation of all composites except Surveillance/Communications (SC), for which training success was the sole criterion measure. Both types of criterion measures were used for the Clerical (CL), Mechanical Maintenance (MM), and Skilled Technical (ST) composites. The samples sizes ranged from about 100 cases to over 2000; the number of MOS samples included for each composite ranged from two for Electronic Repair (EL) and General Maintenance (GM) to 10 for Clerical (CL).

The correlation coefficients between each ASVAB subtest and the criterion measures corrected for restriction in range, are shown in Appendix A. The standard ASVAB intercorrelation matrix is shown in Appendix B. The coefficients for MOS that have the same aptitude composite as a prerequisite were averaged to obtain a vector of mean validity coefficients, and the mean validity vectors are shown in Table 4.

The vectors of mean validity coefficients were used to select the most valid subtests to include in each composite (except as noted in the Procedures section above). The test selection procedures first selected the most valid

[4]Validation of the ASVAB against success in training was completed by Mr. R. Ross and Dr. M. Fischl, ARI. They kindly made the results of their analysis available for use in developing composites for ASVAB 8/9/10.

Table 3

MOS SAMPLES USED TO VALIDATE THE ASVAB

Aptitude Composite	Job Proficiency SQT	N	Training Success MOS	N
Combat (CO)	11B77[a]	2733	None	
	11B78	442		
	11C77	919		
	11C78	93		
	11D77	356		
	11E77	860		
Field Artillery (FA)	13B78	436	None	
	13E78	98		
Electronics Repair(EL)[b]	24M79	202	None	
	27E79	147		
	36C79	2328		
	36K79	2217		
Operators and Food (OF)	16D77	134	None	
	16E77	93		
	16P77	405		
	16R77	182		
Surveillance and Communication (SC)	None		05B/C	78
			05E	119
			05F	257
			72E	233
Mechanical Maintenance (MM)	63B78	131	62B	128
			63B	124
General Maintenance (GM)	55B79	659	None	
	57H79	220		
Clerical (CL)	76D77	421	71B	311
	76P77	87	73C	77
	76Y77	322	75(CMF)	192
			76Y	124
Skilled Technical (ST)	95B77	1013	91B	311
			95B	166

[a]First three characters are MOS and Last two digits are year of testing.
[b]Only 24M79 and 27E79 used to verify composite.

Table 4

MEAN VALIDITY COEFFICIENT OF ASVAB SUBTESTS

MOS Group	ASVAB Subtest[a]								
	WK	AR	NO	AD	MK	EI	MC	AS	GS
Combat (CO)	48	49	38	24	49	50	51	42	49
Field Artillery (FA)	50	57	42	29	57	53	51	41	51
Operators/Food (OF)	22	51	34	22	48	56	54	50	52
Surveillance/ Communication (SC)	38	42	43	30	45	41	40	36	42
Mechanical Maintenance (MM)	39	39	36	22	37	44	42	45	40
Clerical (CL)	50	53	51	27	55	38	37	23	48
Skilled Technical (ST)	67	62	49	24	60	64	62	52	66
General Maintenance (GM)	61	57	52	30	69	62	56	50	63
Electronics Repair (EL)[1]	46	47	37	26	51	54	53	52	51

[a]Subtest Titles:

VE - Verbal (Word Knowledge plus Paragraph Comprehensions)
AR - Arithmetic Reasoning
NO - Numerical Operations
CS - Coding Speed
MC - Mechanical Comprehension
AS - Auto Shop Information
MK - Mathematics Knowledge
EI - Electronics Information
GS - General Science

[b]The mean validity coefficients are based on two specialties, 24M and 27E; the other two specialties, 36C and 36K, were not used to verify the EL composite.

subtest; then removed the effects of that subtest from the remaining subtest and criterion scores; the subtest with the next highest validity (after the effects of the first subtest had been removed) was then selected. This process was repeated until none of the remaining subtests contributed substantially to the predictive validity of the composite. The subtests in each composite are shown in Table 5.

There are several exceptions to the above procedure for selecting subtests for each composite. One exception is that the General Technical (GT) composite traditionally has been defined as Word Knowledge plus Arithmetic Reasoning. Since it is not used as a prerequisite for MOS training, the decision was made to retain the traditional definition, but to expand Word Knowledge to the Verbal score by also including the Paragraph Comprehension subtest. A second exception is the Clerical (CL) composite. The data indicated that the inclusion of the Arithmetic Reasoning subtest would have resulted in a higher validity than using the Verbal, Coding Speed, and Numerical Operations subtests by themselves. Inclusion of Arithmetic Reasoning would have increased the validity of the Clerical (CL) composite by three points, from .55 to .58 Since by excluding Arithmetic Reasoning, the Clerical (CL) composite is the same for all services, the decision was to strive for communality among all services and delete Arithmetic Reasoning.

Another exception is the computation of Electronic Repair (EL) and General Maintenance (GM) aptitude composites. The SQT data for these composites did not become available for analysis until fall 1980, long after the subtests in each composite had to be specified. Because ASVAB 8/9/10 was scheduled for implementation on 1 October 1980, the composites had to be defined by fall 1979 to allow for printing of the testing and scoring materials. The results for these two composites are included here to complete the validity picture for the ASVAB.

For Electronics Repair (EL) only two skill specialties were used to verify the validity of the composite, which had been defined by expert judgment. These are highly technical specialties (24M and 27E) typical of the skills and knowledge required of other electronics repair jobs. The SQT for two other electronics specialties, 36C and 36K, were also available but were used only incidentally. One reason is that the skill and knowledge requirements for these specialties are considerably lower than the highly technical repair MOS. The second is that the SQT for 36C and 36K are suspect. For both MOS, about a quarter of the sample received perfect SQT scores which suggests that the tests were inordinately easy. Therefore only the highly technical specialties (24M and 27E) were used for verifying the Electronics Repair (EL) composite.

The test selection procedure to identify the most valid subtests in the Electonics Repair (EL) composite resulted in selecting Electronics Information and Mathematics Knowledge as the first two subtests chosen, and both of these are in the composite. The other two subtests in Electronics Repair (EL), Arithmetic Reasoning and General Science, however, were not selected until other subtests had been selected. The best combination of subtests included Electronics Information and Mathematics Knowledge, plus Auto/Shop Information and Mechanical Comprehension rather than Arithmetic Reasoning and General Science; the best set of subtests had a validity coefficient of .62, as compared to .59 for the operational set of subtests.

Table 5

ASVAB - 8/9/10
ARMY APTITUDE COMPOSITES

COMPOSITE	ASVAB Subtest[a]									Estimated Validity
	VE	AR	NO	CS	MC	AS	MK	EI	GS	
AFQT	X	X	X							.55[b]
Combat (CO)		X		X	X	X				.56
Field Artillery (FA)		X		X	X		X			.63
Electronics Repair (EL)		X					X	X	X	.59
Operators/Food (OF)	X		X		X	X				.61
Surveillance/ Communication (SC)	X		X	X		X				.55
Mechanical Maintenance (MM)		X			X	X		X		.52
General Maintenance (GM)						X	X	X	X	.73
Clerical (CL)	X		X	X						.53
Skilled Technical (ST)	X				X		X		X	.75
General Technical (GT)	X	X								

[a]Subtest Titles:

VE - Verbal (Word Knowledge plus Paragraph Comprehension)
AR - Arithmetic Reasoning
NO - Numerical Operations
CS - Coding Speed
MC - Mechanical Comprehension
AS - Auto Shop Information
MK - Mathematics Knowledge
EI - Electronics Information
GS - General Science

[b]Validity of AFQT is average coefficient for all skills.

The General Maintenance (GM) composite, which had also been defined on the basis of expert judgment, was verified by the results for the two skill specialties that had SQT scores available. This composite in ASVAB 8/9/10 contains Mathematics Knowledge, Electronics Information, General Science, and Auto/Shop Information. For both specialties, Mathematics Knowledge and Electronics Information were the first two tests selected, and for the 55B MOS the third and fourth test were General Science and Auto/Shop Information. A similar result was obtained for the 57H MOS, except that Numerical Operations was selected as the fourth subtest with General Science as the fifth. Numerical Operation is a speeded test of perceptual accuracy, and has no apparent relationship to job requirements in the General Maintenance (GM) area. Therefore it would not be included in the composite on content considerations. These results confirmed the General Maintenance (GM) composite.

One of the significant improvements is the new Operators/Food (OF) composite. The old Operators/Food (OF) composite contained the General Information, Attention to Detail, and Attentiveness subtests. Only General Information required the ability to demonstrate verbal skills and knowledge; the Attentiveness score measures interest and experiences, and Attention to Detail is a measure of perceptual speed. The new Operators/Food (OF) composite contains the Verbal, Mechanical Comprehension and Automotive-Shop Information subtests, plus Numerical Operations, a measure of perceptual speed.

The new composites were found to have adequate validity to serve as effective predictors of job proficiency. The validity coefficients for predicting SQT scores are comparable to those typically found for predicting final course grades in traditional training programs. Thus the ASVAB is an effective predictor of the skills and knowledges required to perform the variety of Army skills, as measured by Skill Qualification Tests.

DISCUSSION AND CONCLUSIONS

Criterion Measures in Modern Training Programs

The empirical validity of the ASVAB will become increasingly difficult to demonstrate, if indeed the battery is still valid, for training programs employing modern instructional technology. Army training programs have been redesigned during the 1970's to have the following characteristics that impinge on the validity of the ASVAB:

a. pass-fail scoring, with no rank order information reported within each score category;

b. performance-based training and testing, with focus on developing and evaluating the skills and knowledges required to perform prescribed job tasks;

c. self-pacing, with each student terminating training in each unit of instruction as soon as the minimum requirements in that unit are satisfied.

Traditional training programs, in contrast, featured training content, techniques, and evaluation procedures that maximized the relationship to paper-and-pencil aptitude tests. Course content tended to focus on principles, knowledges and functions as presented in lectures and demonstrations by the instructor, with occasional practical exercises to provide hands-on training for specific job tasks. All students in the traditional courses were exposed to the same material for the same amount of time (group paced) instead of moving on as soon as the minimal requirements in an instructional unit were met. The practice of exposing all students to the same material for the same amount of time tended to produce variation in the levels of achievement. And perhaps most important, in traditional courses final course grades were determined primarily by paper-and-pencil achievement tests that bear a close resemblance to the aptitude tests. In some respects the high validity of aptitude tests for predicting final course grades in traditional training programs may have been an artifact of the way achievement was evaluated.

Job Proficiency as a Criterion

The high degree of relationship between ASVAB and SQT scores came as a surprise to many observers. Some of the reasons have been alluded to in this report, and the concluding section may be a good place to address them more specifically.

Proficiency vs Performance. A long standing argument is that aptitude tests cannot predict job performance, and ASVAB scores therefore should not be related to measures of job performance. Performance, which is what a person actually does on the job, is a different concept than proficiency, which refers to the skills and knowledges a person possesses. Performance includes components of motivation and supervision, in addition to proficiency. SQTs are measures of proficiency rather than performance, and therefore a more precise statement is that ASVAB predicts job proficiency rather than job performance.

Quality of ASVAB. The original ASVAB fell on hard times during its lifetime from 1976 until October 1980, when new forms were introduced. Scores of the earlier version were suspect because of wide-spread test compromise (coaching on the test) as reported in the nation's press in late 1977 and an inflated score scale which overestimated the aptitude of recruits. The scores, therefore were untrustworthy, and a natural inference is that they could not predict subsequent performance.

Quality of the SQTs as measures of job proficiency. A final concern is whether SQTs are reliable and valid of job proficiency. The meaning of SQT scores has been controversial in the Army, and SQTs themselves have been criticized in many quarters as poor measures of performance. One reason may be that many examinees "fail" the test; and therefore in many skill specialties the majority of the job incumbents are nominally unqualified. Since this outcome is clearly undesirable, a conclusion is that the test themselves are not functioning properly.

The passing score for SQTs is an arbitrarily chosen number; currently 60 percent of the items must be correct to pass the test.[5] The difficulty of the test is not taken into account in setting the passing score. The percent passing an SQT is a joint function of the proficiency of the examinees and difficulty of the tasks included in an SQT. It may be recalled that a major consideration in selecting tasks for SQTs is known training deficiencies, which means that these tasks tend to have low pass rates. The passing score of 60 percent may be unduly high for specialties with many training deficiencies. However, because the policy is to set the passing score prior to test administration and to have all passing scores the same, the pass rates for specialties will continue to fluctuate until test developers learn how to pitch the test at the desired level of difficulty.

A key element in assessing the quality of SQTs as measures of job proficiency is to examine the developmental process. Briefly reviewed, all the tasks selected for testing are critical to the job and many of them may be especially difficult. The tasks and measures are reviewed by job experts and tried out on representative workers. Examinees are informed beforehand about the tasks that are covered by the SQT, which gives them an equal opportunity to prepare. The process is designed to produce quality measures of proficiency, and there is no reason to question the generalizability of scores on the tasks in the test to the other critical tasks in a specialty. It is possible that some SQTs are not developed according to this model, and the quality may be lower. Individual exceptions do not negate the quality of the procedures, and therefore the test developed according to the procedures are expected to be adequate criterion measures of job proficiency.

The proficiency measures used in this validation effort were the first generation of SQTs, which contained a large component of paper-and-pencil type achievement tests. The second generation SQT beginning in 1980's emphasizes hand-on performance more than paper-and-pencil tests for some specialties; the validity of the ASVAB for these SQTs is not known at the time of this writing.

The changing nature of the criterion measures in the Army will require new strategies for validating ASVAB. Traditionally, the ASVAB has been described as a measure of trainability, which generally meant the ability to predict success in the traditional training programs. Modern instructional technology, with pass-fail scoring of performance, is forcing a reevaluation of the utility of ASVAB as a predictor of training success. The interest is growing among personnel managers in the effectiveness of ASVAB as a predictor of job performance.

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[5]Technically speaking 60 percent of the scorable units must be scored as "Go," where a scorable unit is a set of written items or performance measures related to a specific task. The number of items correct need not be 60 percent in order to be "Go" on 60 percent of the scorable units; but the relationship is close enough for these purposes, and it is easier to understand that 60 percent of the items must be correct.

SQTs promise to provide a breakthrough in providing operational measures of job proficiency, and they proved in this research effort to be useful criterion measures. Extensive effort will be required to develop a research program to validate the ASVAB against measures of success in modern skill training courses, and against job performance, the criterion so long sought by the testing community.

APPENDIX A

VALIDITY COEFFICIENTS OF ASVAB SUBTESTS

MOS	Type of Criterion	ASVAB Subtests															
		GI	NO	AD	WK	AR	SP	MK	EI	MC	GS	SI	AI	CM	CA	CE	CC
A. Combat (CO)																	
11B77	SQT	50	39	23	47	48	36	48	52	50	50	47	43	11	07	08	36
11B78	SQT	51	37	19	46	44	37	46	48	55	47	46	44	10	05	11	34
11C77	SQT	47	39	24	49	53	36	52	49	50	52	43	42	07	11	07	31
11C78	SQT	45	45	33	52	55	38	60	48	51	50	39	34	-04	09	00	26
11D77	SQT	44	38	30	49	48	40	47	48	51	47	36	39	06	08	11	28
11E77	SQT	48	28	14	42	65	36	43	51	49	46	46	45	18	02	17	33
CO	SQT	47	38	24	48	49	37	49	50	51	49	43	41	08	07	09	31
B. Field Artillery (FA)																	
13B78	SQT	46	44	24	48	53	34	55	51	48	53	41	36	09	08	14	37
13B78	SQT	49	41	33	53	61	53	60	54	55	49	41	44	17	13	27	37
FA	SQT	48	42	29	50	57	44	57	53	51	51	41	40	13	10	20	37
C. Electronics Repair (EL)																	
24M79	SQT	49	35	28	43	43	35	49	44	43	49	43	42	07	17	22	29
27E79	SQT	66	38	25	48	51	28	53	63	63	53	65	55	27	-02	21	54
36C79[1]	SQT	13	15	10	14	16	13	15	19	15	14	16	15	06	03	03	12
36K79[1]	SQT	16	17	12	17	20	15	18	20	19	17	19	17	09	01	05	14
EL	SQT	58	37	26	46	47	31	51	54	53	51	54	49	17	08	22	41

[1]MOS not used in computing average validity vector

APPENDIX A (Cont'd)

MOS	Type of Criterion	ASVAB Subtests																
		GI	NO	AD	WK	AR	SP	MK	EI	MC	GS	SI	AI	CM	CA	CE	CC
D. Operators/Food (OF)																		
16D77	SQT	56	50	37	65	64	51	62	67	64	62	62	60	15	21	13	33
16E77	SQT	42	19	02	53	44	49	35	60	51	51	51	57	20	-03	05	28
16P77	SQT	47	37	20	41	49	41	47	49	50	43	47	43	16	05	09	34
16R77	SQT	44	32	29	42	47	21	49	50	48	52	38	42	07	07	02	24
OF	SQT	47	34	22	50	51	40	48	56	54	52	49	51	15	08	07	30
E. Surveillance/ Communication (SC)																		
05B/C	AIT	32	36	32	34	26	01	28	28	21	28	26	29	21	12	01	23
05E	AIT	43	49	23	42	56	44	57	49	55	54	48	46	03	-08	01	45
05F	AIT	29	42	22	34	40	29	45	44	42	38	37	35	25	29	29	32
72E	AIT	31	50	41	44	48	24	50	44	43	48	31	34	-14	34	03	09
SC	AIT	34	43	30	38	42	25	45	41	40	42	35	36	08	17	09	27
F. Mechanical Maintenance (MM)																		
63B77	SQT	45	43	25	40	39	29	40	47	45	47	53	54	06	04	-03	29
62B	AIT	39	35	18	38	39	16	25	36	35	34	39	38	24	08	18	23
63B	AIT	49	30	23	39	39	39	45	50	47	39	42	44	31	01	04	27
MM	BOTH	44	36	22	39	39	28	37	44	42	40	45	45	20	05	07	26

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APPENDIX A (Cont'd)

MOS	Type of Criterion	ASVAB Subtests															
		GI	NO	AD	WK	AR	SP	MK	EI	MC	GS	SI	AI	CM	CA	CE	CC
G. General Maintenance (GM)																	
55B79	SQT	56	49	26	61	54	34	67	61	52	64	51	49	07	15	06	33
57H79	SQT	51	55	34	60	60	36	71	63	60	62	51	49	11	12	07	38
GM	SQT	54	52	30	60	57	35	69	62	56	63	51	49	09	13	07	36
H. Clerical (CL)																	
76D77	SQT	44	47	28	52	54	34	57	49	45	53	34	39	01	23	09	24
76P77	SQT	39	43	14	51	64	30	56	40	36	43	29	34	-06	37	11	21
76Y77	SQT	47	52	34	58	60	41	61	54	49	56	39	36	-10	22	04	22
71B	AIT	19	53	47	54	49	31	53	36	35	45	07	24	-35	35	-30	21
73C	AIT	-02	41	15	30	38	20	43	04	13	31	13	-04	-55	35	-15	-17
75(CMF)	AIT	26	55	30	45	48	22	54	33	31	49	05	16	-17	40	-06	13
76Y	AIT	40	63	22	59	62	31	64	50	48	55	31	20	-47	48	-31	03
CL	SQT	43	47	25	54	59	35	58	48	43	51	34	36	-05	27	08	22
CL	AIT	21	53	29	47	49	26	53	30	32	45	14	41	-39	39	-20	05
CL	BOTH	30	51	27	50	53	30	55	38	37	48	23	23	-24	34	-08	12
I. Skilled Technical (ST)																	
95B		60	45	26	64	59	44	58	65	60	61	54	50	09	14	14	39
91B		59	52	23	70	65	45	63	64	65	70	54	52	-03	30	21	29
ST		59	49	24	67	62	45	60	64	62	66	54	51	03	22	17	34

APPENDIX B

ASVAB SUBTEST STANDARD POPULATION MATRIX*

	GI	NO	AD	WK	AR	SP	MK	EI	MC	GS	SI	AI	CM	CA	CE	CC
GI	100	43	22	61	53	35	49	65	57	63	63	63	21	07	13	45
NO	43	100	48	51	58	27	64	43	39	49	31	26	-09	26	03	25
AD	22	48	100	27	31	26	33	24	25	26	17	11	-03	19	01	18
WK	61	51	27	100	68	43	65	67	59	74	46	46	-03	21	04	33
AR	53	58	31	68	100	51	75	60	63	63	45	43	05	20	18	34
SP	35	27	26	43	51	100	44	46	57	41	37	34	14	08	18	24
MK	49	64	33	65	75	44	100	57	59	63	37	36	-07	22	16	26
EI	65	43	24	67	60	46	57	100	71	67	69	69	28	12	19	42
MC	57	39	25	59	63	57	59	71	100	62	63	59	25	03	21	43
GS	63	49	26	74	63	41	63	67	62	100	56	54	05	19	12	38
SI	63	31	17	46	45	37	37	69	63	56	100	74	40	-09	13	52
AI	62	26	11	46	43	34	36	69	59	54	74	100	44	-02	19	41
CM	21	-09	-03	-03	05	14	-07	28	25	05	40	44	100	-06	48	39
CA	07	26	19	21	20	08	22	12	03	19	-09	-02	-06	100	25	-03
CE	13	03	01	04	18	18	16	19	21	12	13	19	48	25	100	19
CC	45	25	18	33	34	24	26	42	43	38	52	41	39	-03	19	100
s.d.	3.35	10.31	4.02	7.54	4.75	4.07	4.93	6.14	4.30	4.00	4.81	4.54	4.88	3.19	4.42	3.90

*Based on 1000 Stratified Cases tested at AFEES in January 1976.

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